

Patent claims

1. A dust-collecting filter, comprising:
an air-permeable filter material; and
an adsorbing agent being contained in a loose form in the
dust-collecting filter, the adsorbing agent comprising at least
one of fibres, flakes and granulate as a supporting material
onto which a powdery adsorption material is applied
superficially.
2. The dust-collecting filter according to claim 1, wherein
the adsorption material is applied in an amount of between 1 and
50 wt-% of the supporting material.
3. The dust-collecting filter according to claim 2, wherein
the adsorption material is applied in an amount of between 7 and
25 wt-% of the supporting material.
4. The dust-collecting filter according to claim 1, wherein
the adsorption material is selected from at least one of active
charcoal, impregnated active charcoal, functionalised carbon,
hydrophobic zeolites, hydrophobic, porous polymers, bentonites
and crystalline organometallic complexes.
5. The dust-collecting filter according to claim 4, wherein
the functionalised carbon is an aromatic carbon skeleton with
functional groups.
6. The dust-collecting filter according to claim 4, wherein
the active charcoal is one of coconut shell, wood, rock and
bamboo charcoal.

7. The dust-collecting filter according to claim 4, wherein the active charcoal is impregnated with at least one of (i) one of acid chemicals and basic chemicals an (ii) silver salts.
8. The dust-collecting filter according to claim 4, wherein the zeolites have micropores of a pore size > 5 A.
9. The dust-collecting filter according to claim 8, wherein the pore size of the micropores is > 6.5 A.
10. The dust-collecting filter according to claim 8, wherein a specific surface of the zeolites is > 400 m²/g.
11. The dust-collecting filter according to claim 8, wherein the zeolites have a modulus > 200.
12. The dust-collecting filter according to claim 8, wherein the zeolites have a modulus > 300.
13. The dust-collecting filter according to claim 8, wherein a particle size of the zeolites is in a range between 2 and 30 μ m.
14. The dust-collecting filter according to claim 4, wherein the porous polymers have micropores of 6 to 20 A, mesopores of 20 to 500 A and macropores > 500 A.
15. The dust-collecting filter according to claim 4, wherein an average pore diameter is between 3 and 300 A.
16. The dust-collecting filter according to claim 4, wherein a particle size of the porous polymers is in a range between 1 and 500 μ m.

17. The dust-collecting filter according to claim 4, wherein a particle size of the porous polymers is in a range between 1 and 200 μm .

18. The dust-collecting filter according to claim 4, wherein the pore volume is equal to $0.4 \text{ cm}^3/\text{g}$.

19. The dust-collecting filter according to claim 4, wherein the porous polymers are hydrophobic.

20. The dust-collecting filter according to claim 4, wherein the porous polymers are constructed from at least one of styrene, acrylic acid and their derivatives.

21. The dust-collecting filter according to claim 1, wherein the adsorption material is at least one of chemically bound and physically bound to the supporting material.

22. The dust-collecting filter according to claim 1, wherein the adsorption material is bound to the supporting material which is an electrostatically charged.

23. The dust-collecting filter according to claim 1, wherein the adsorption material is powdery and has a mean particle size between 1 and 100 μm .

24. The dust-collecting filter according to claim 1, wherein the supporting material comprises fibres which are selected from at least one of chemical fibres and natural fibres.

25. The dust-collecting filter according to claim 24, wherein

the fibres are rendered antibacterial.

26. The dust-collecting filter according to claim 24, wherein the chemical fibres are cellulose fibres.

27. The dust-collecting filter according to claim 24, wherein the chemical fibres are at least one of viscose fibres and synthetic fibres.

28. The dust-collecting filter according to claim 26, wherein the synthetic fibres are selected from fibres formed from at least one of polyolefins, polyester, polyamides, polyacrylonitrile and polyvinyl alcohol.

29. The dust-collecting filter according to claim 24, wherein the natural fibres are selected from at least one of cellulose, wood fibre materials, kapok, flax, jute, Manila hemp, coco, wool, cotton, Kenaf, abaca, mulberry bast and fluff pulp.

30. The dust-collecting filter according to claim 24, wherein the fibres are at least one of smooth, branched, crimped, hollow and textured and have a non-circular cross-section.

31. The dust-collecting filter according to claim 24, wherein the fibres are at least one of smooth, branched, crimped, hollow and textured and have a trilobal cross-section.

32. The dust-collecting filter according to claim 24, wherein the fibres have a mean length of between 0.3 mm and 100 mm.

33 The dust-collecting filter according to claim 24, wherein the fibres have a mean length of between 0.5 mm and 70 mm.

34. The dust-collecting filter according to claim 24, wherein the fibres have a mean length of between 1 and 9.5 mm.

35. The dust-collecting filter according to claim 1, wherein the supporting material comprises flakes which are selected from cellular plastics, non-wovens, textiles, foamed starch, foamed polyolefins, as well as films and recovered fibres.

36. The dust-collecting filter according to claim 35, wherein the flakes have a diameter between 0.3 mm and 30 mm.

37. The dust-collecting filter according to claim 35, wherein the flakes have a diameter between 0.5 mm and 20 mm.

38. The dust-collecting filter according to claim 35, wherein the flakes have a diameter between 1 and 9.5 mm.

39. The dust-collecting filter according to claim 1, wherein the supporting material comprises granulates which are selected from macroporous polymers.

40. The dust-collecting filter according to claim 39, wherein a particle size of the granulates is in a range between 0.2 and 1.5 mm.

41. The dust-collecting filter according to claim 39, wherein a particle size of the granulates is in a range between 0.3 and 1.0 mm.

42. The dust-collecting filter according to claim 39, wherein the macroporous polymers are constructed from at least one of

polystyrene, acrylic acid and their derivatives.

43. The dust-collecting filter according to claim 39, wherein a surface of the macroporous polymers is $> 200 \text{ m}^2/\text{g}$.

44. The dust-collecting filter according to claim 39, wherein a surface of the macroporous polymers is $> 350 \text{ m}^2/\text{g}$.

45. The dust-collecting filter according to claim 39, wherein the porosity is less or equal to 0.4 ml/ml .

46. The dust-collecting filter according to claim 1, wherein the adsorbing agent is enclosed in an air-permeable wrapper.

47. The dust-collecting filter according to claim 46, wherein the wrapper is an air-permeable non-woven.

48. The dust-collecting filter according to claim 1, wherein between 0.03 and 5 g of the adsorbing agent per 1000 cm^3 are contained in the dust-collecting filter.

49. The dust-collecting filter according to claim 48, wherein between 0.3 and 2 g of the adsorbing agent are contained per 1000 cm^3 .

50. The dust-collecting filter according to claim 1, wherein the adsorbing agent is present in a bag, which has an air-permeable wrapper, in the dust-collecting filter.

51. The dust-collecting filter according to claim 50, wherein the adsorbing agent is arranged under a covering in part of an inner surface of the dust-collecting filter.

52. The dust-collecting filter according to claim 51, wherein the covering is a non-woven layer.

53. The dust-collecting filter according to claim 51, wherein the adsorbing agent is contained in a pad which is arranged on part of the inner surface of the dust-collecting filter.

54. The dust-collecting filter according to claim 53, wherein the pad comprises at least one layer of one of a filter paper and a special non-woven, the adsorbing agent arranged on the surface of the filter paper being covered by the at least one non-woven layer.

55. The dust-collecting filter according to claim 50, wherein the wrapper material of one of the bag and the covering is formed from a material which is destructable under operating conditions.

56. The dust-collecting filter according to claim 1, wherein the dust-collecting filter has predetermined dimensions and design to operate with a volume flow rate between 10 cm³/h and 400 m³/h.

57. The dust-collecting filter according to claim 1, wherein the filter material of the dust-collecting filter is at least one of (i) one of a single-layer paper and a multilayer paper and (ii) a non-woven material.

58. The dust-collecting filter according to claim 1, wherein the dust-collecting filter is a vacuum-cleaner bag.

59. The dust-collecting filter according to claim 1, wherein dust-collecting filter is one of a pleated filter and a bag filter.

60. A method, comprising:
adsorbing odours with a dust-collecting filter according to claim 1.

61. The method according to claim 60, wherein between 0.2 and 5 g of the adsorbing agent are used per 1000 cm³ of the dust-collecting filter.

62. The method according to claim 60, further comprising:
introducing the adsorbing agent into the dust-collecting filter one of (i) before a start of a first suction process and (ii) at the start of the suction process.

63. The method according to claim 60, wherein the adsorbing agent is present in a wrapper and, the method further comprising:
introducing the adsorbing agent into the dust-collecting filter one of (i) before a start of a first suction process and (ii) at the start of the suction process.

64. The method according to claim 63, wherein the wrapper is destroyable at a predefined volume flow rate.

65. The method according to claim 60, wherein the method is for vacuum-cleaning using one of a cylinder vacuum-cleaner and an upright vacuum-cleaner.1. ~~Adsorbing agent for dust-collecting filters, especially for adsorbing odours, characterised in that the adsorbing agent comprises fibres,~~

~~flakes and/or granulate as a supporting material onto which a powdery adsorption material is applied superficially.~~

~~2. Adsorbing agent according to claim 1, characterised in that the adsorption material is applied in an amount of 1 to 50 wt % of the supporting material.~~

~~3. Adsorbing agent according to claim 2, characterised in that 7 to 25 wt % are applied.~~

~~4. Adsorbing agent according to at least one of claims 1 to 3, characterised in that the adsorption material is selected from active charcoal, impregnated active charcoal, functionalised carbon, hydrophobic zeolites, hydrophobic, porous polymers, bentonites and/or crystalline organometallic complexes.~~

~~5. Adsorbing agent according to claim 4, characterised in that the functionalised carbon is an aromatic carbon skeleton with functional groups.~~

~~6. Adsorbing agent according to claim 4, characterised in that the active charcoal is coconut shell, wood, rock or bamboo charcoal.~~

~~7. Adsorbing agent according to claim 4 or 5, characterised in that the active charcoal is impregnated with acid or basic chemicals and/or with silver salts.~~

~~8. Adsorbing agent according to claim 4, characterised in that the zeolites have micropores of a pore size $> 5 \text{ \AA}$.~~

- ~~9. Adsorbing agent according to claim 8, characterised in that the pore size of the micropores is $> 6.5 \text{ \AA}$.~~
- ~~10. Adsorbing agent according to claim 8 or 9, characterised in that the specific surface of the zeolite is $> 400 \text{ m}^2/\text{g}$.~~
- ~~11. Adsorbing agent according to at least one of claims 8 to 10, characterised in that the zeolites have a modulus > 200 , preferably > 300 .~~
- ~~12. Adsorbing agent according to at least one of claims 8 to 11, characterised in that the particle size of the zeolites is in the range between 2 and 30 μm .~~
- ~~13. Adsorbing agent according to claim 4, characterised in that the porous polymers have micropores of 6 to 20 \AA , mesopores of 20 to 500 \AA and macropores $> 500 \text{ \AA}$.~~
- ~~14. Adsorbing agent according to claim 4 or 13, characterised in that the average pore diameter is between 3 and 300 \AA .~~
- ~~15. Adsorbing agent according to claim 4, 13 or 14, characterised in that the particle size of the porous polymers is in the range between 1 and 500 μm , preferably between 1 and 200 μm .~~
- ~~16. Adsorbing agent according to at least one of claims 4, 13 to 15, characterised in that the pore volume is $\geq 0.4 \text{ cm}^3/\text{g}$.~~
- ~~17. Adsorbing agent according to at least one of claims 4, 13 to 15, characterised in that the porous polymers are hydrophobic.~~

- ~~18. Adsorbing agent according to at least one of claims 4, 13 to 17, characterised in that the porous polymers are constructed from styrene, acrylic acid and/or their derivatives.~~
- ~~19. Adsorbing agent according to at least one of claims 1 to 18, characterised in that the adsorption material is chemically and/or physically bound to the supporting material.~~
- ~~20. Adsorbing agent according to at least one of claims 1 to 19, characterised in that the adsorption material is bound to an electrostatically charged supporting material.~~
- ~~21. Adsorbing agent according to at least one of claims 1 to 20, characterised in that the adsorption material is powdery and has a mean particle size of 1 to 100 μm .~~
- ~~22. Adsorbing agent according to at least one of claims 1 to 21, characterised in that the supporting material comprises fibres which are selected from chemical fibres and/or natural fibres.~~
- ~~23. Adsorbing agent according to claim 22, characterised in that the fibres are rendered antibacterial.~~
- ~~24. Adsorbing agent according to claim 22 or 23, characterised in that the chemical fibres are cellulose fibres such as viscose and/or synthetic fibres.~~

- ~~25. Adsorbing agent according to claim 24, characterised in that the synthetic fibres are selected from fibres formed from polyolefins, polyester, polyamides, polyacrylonitrile and/or polyvinyl alcohol.~~
- ~~26. Adsorbing agent according to claim 22 or 23, characterised in that the natural fibres are selected from cellulose, wood fibre materials, kapok, flax, jute, Manila hemp, coco, wool, cotton, Kenaf, abaca, mulberry bast and/or fluff pulp.~~
- ~~27. Adsorbing agent according to at least one of claims 22 to 26, characterised in that the fibres are smooth, branched, crimped, hollow and/or textured and have a non circular (e.g. trilobal) cross section.~~
- ~~28. Adsorbing agent according to at least one of claims 22 to 27, characterised in that the fibres have a mean length of between 0.3 mm and 100 mm, preferably between 0.5 and 70 mm.~~
- ~~29. Adsorbing agent according to claim 28, characterised in that the fibres have a mean length of 1 to 9.5 mm.~~
- ~~30. Adsorbing agent according to at least one of claims 1 to 29, characterised in that the supporting material comprises flakes which are selected from cellular plastics, non-wovens, textiles, foamed starch, foamed polyolefins, as well as films and recovered fibres.~~

- ~~31. Adsorbing agent according to claim 30, characterised in that the flakes have a diameter of 0.3 mm to 30 mm, preferably 0.5 to 20 mm.~~
- ~~32. Adsorbing agent according to claim 31, characterised in that the flakes have a diameter of 1 to 9.5 mm.~~
- ~~33. Adsorbing agent according to at least one of claims 1 to 32, characterised in that the supporting material comprises granulates which are selected from macroporous polymers.~~
- ~~34. Adsorbing agent according to claim 33, characterised in that the particle size of the granulates is in the range between 0.2 and 1.5 mm, preferably between 0.3 and 1.0 mm.~~
- ~~35. Adsorbing agent according to claim 33 or 34, characterised in that the macroporous polymers are constructed from polystyrene, acrylic acid and/or their derivatives.~~
- ~~36. Adsorbing agent according to at least one of claims 33 to 36, characterised in that the surface of the macroporous polymers is $> 200 \text{ m}^2/\text{g}$, preferably $> 350 \text{ m}^2/\text{g}$.~~
- ~~37. Adsorbing agent according to at least one of claims 33 to 36, characterised in that the porosity $\geq 0.4 \text{ ml/ml}$.~~
- ~~38. Adsorbing agent according to at least one of claims 1 to 37, characterised in that the adsorbing agent is enclosed in an air permeable wrapper.~~
- ~~39. Adsorbing agent according to claim 38, characterised in that the wrapper is an air permeable non woven.~~

- ~~40. Dust collection chamber, especially for a vacuum cleaner, to which air can be applied, characterised in that an adsorbing agent according to one of claims 1 to 39 is contained in the dust collection chamber.~~
- ~~41. Dust collection chamber according to claim 40, characterised in that 0.03 to 5 g of the adsorbing agent per 1000 cm³ are contained in the dust collection chamber.~~
- ~~42. Dust collection chamber according to claim 41, characterised in that 0.3 to 2 g adsorbing agent are contained per 1000 cm³.~~
- ~~43. Dust collection chamber according to at least one of claims 40 to 42, characterised in that it is the dust collection chamber of a bagless vacuum cleaner.~~
- ~~44. Dust collection chamber according to at least one of claims 40 to 43, characterised in that that it is formed by a refuse collection container.~~
- ~~45. Dust collection chamber according to at least one of claims 40 to 44, characterised in that it is formed by a dust collecting filter made of an air permeable filter material.~~
- ~~46. Dust collection chamber according to claim 45, characterised in that the adsorbing agent is present in a bag, which has an air permeable wrapper, in the dust collecting filter.~~

- ~~47. Dust collection chamber according to claim 45 or 46, characterised in that the adsorbing agent is arranged under a covering in part of the inner surface of the dust-collecting filter.~~
- ~~48. Dust collection chamber according to claim 47, characterised in that the covering is a non woven layer.~~
- ~~49. Dust collection chamber according to claim 47, characterised in that the adsorbing agent is contained in a pad which is arranged on part of the inner surface of the dust-collecting filter.~~
- ~~50. Dust collection chamber according to claim 49, characterised in that the pad comprises at least one layer of a filter paper or of a special non woven, the adsorbing agent arranged on the surface of the filter paper being covered by at least one non woven layer.~~
- ~~51. Dust collection chamber according to at least one of claims 46 to 50, characterised in that the wrapper material of the bag or the covering is formed from a material which can be destroyed under operating conditions.~~
- ~~52. Dust collection chamber according to at least one of claims 45 to 51, characterised in that the dust-collecting filter is of such dimensions and design that it can be operated with a volume flow rate of $10 \text{ cm}^3/\text{h}$ to $400 \text{ m}^3/\text{h}$.~~
- ~~53. Dust collection chamber according to at least one of claims 45 or 52, characterised in that the filter material of the~~

~~dust collecting filter is a single layer or multilayer paper and/or non woven material.~~

~~54. Dust collection chamber according to at least one of claims 45 to 53, characterised in that it is formed by a vacuum cleaner bag.~~

~~55. Dust collection chamber according to at least one of patent claims 45 to 53, characterised in that it is formed by a pleated filter or bag filter.~~

~~56. Method for adsorbing odours in a dust collection chamber according to at least one of claims 45 to 55, characterised in that an adsorbing agent according to one of claims 1 to 39 is used for it.~~

~~57. Method according to claim 56, characterised in that 0.2 to 5 g adsorbing agent are used per 1000 cm³ dust collection chamber.~~

~~58. Method according to claim 56 or 57, characterised in that an air permeable dust collecting filter is used as the dust collection chamber.~~

~~59. Method according to claim 58, characterised in that the adsorbing agent is introduced into the dust collecting filter before the start of a first suction process or at the start of the suction process.~~

~~60. Method according to at least one of claims 58 or 59, characterised in that the adsorbing agent is present in a wrapper and is introduced into the dust collecting filter~~

~~before the start of a first suction process or at the start of the suction process.~~

~~61. Method according to claim 60, characterised in that the wrapper is so designed that it is destroyed at the given volume flow rate.~~

~~62. Method according to at least one of claims 58 to 61, characterised in that this is a method for vacuum cleaning using a cylinder vacuum cleaner or an upright vacuum cleaner.~~

~~63. Use of the adsorbing agent according to at least one of claims 1 to 39 for adsorbing odours.~~